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***IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF APPEALS AND INTERFERENCES***

In re Application of: An-hsiang Wu, Joseph E. Bares, and Charles A. Drake

Serial No.: 10/023,023

Group Art Unit: 1764

Filed: November 28, 2001

Examiner: James Arnold, Jr.

For: HYDRODESULFURIZATION CATALYST AND PROCESS THEREFOR
AND THEREWITH

APPELLANTS' BRIEF ON APPEAL

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the Notice of Appeal, which was mailed on June 16, 2004, the Appellant respectfully submits this Appeal Brief. The Appellant respectfully requests that the claims in question be allowed.

Real Party of Interest

ConocoPhillips Company, formerly known as Phillips Petroleum Company, is the assignee of record of the above-captioned application and, thus, is the real party of interest in this appeal.

Related Appeals and Interferences

It is believed that there are no appeals or interferences, which will directly affect or be directly affected by or have a bearing on the Board Decision on this Appeal.

Status of Claims

Appellant appeals the Final Rejection of pending claims 1- 17.

Status of Amendments

A Final Office Action was mailed on December 18, 2003, wherein the Examiner finally rejected claims 1-17. A Response after Final was mailed on February 23, 2003. The Examiner maintained the Final Rejection of claims 1-17 in an Advisory Action mailed March 17, 2004. A Notice of Appeal was mailed on June 16, 2004.

Summary of the Invention

The invention provides a novel catalyst composition which comprises a nitrided and sulfided composition comprising a cobalt compound, a molybdenum compound, and an inorganic oxide compound (*see, e.g.*, page 3, lines 6-9)

The invention also includes a novel process of making a catalyst composition. The process comprises: incorporating a cobalt compound and a molybdenum compound into an inorganic oxide compound, nitriding the cobalt/molybdenum-modified catalyst, and sulfiding the nitrided cobalt/molybdenum-modified catalyst (*see, e.g.*, page 3, lines 10-14).

The invention also includes a novel hydrodesulfurization process. The hydrodesulfurization process comprises contacting a hydrocarbon feed containing a

concentration of organic sulfur compounds and a concentration of aromatic compounds with a catalyst composition comprising a nitrated and sulfided composition comprising a cobalt compound, a molybdenum compound and an inorganic oxide compound under conditions sufficient to convert at least a portion of the organic sulfur compounds to inorganic sulfur compounds (*see, e.g.*, page 3, lines 15-21).

The invention also includes a novel hydrodesulfurization process. This process comprises separating a full range hydrocarbon feed containing organic sulfur compounds and aromatic compounds into a heavy hydrocarbon fraction with a catalyst comprising a nitrated and sulfided composition comprising a cobalt compound, a molybdenum compound, and an inorganic oxide compound under conditions sufficient to convert at least a portion of the organic sulfur compounds to inorganic sulfur compounds, and combining the hydrodesulfurized heavy hydrocarbon product with the light hydrocarbon fraction to produce a hydrodesulfurized full range hydrocarbon product (*see, e.g.*, page 4, lines 1-10).

Issues

The issues on appeal are:

Whether claims 1-8 are unpatentable under 35 U.S.C. 103(a) as being obvious over Drake et al., U.S. Patent 6,083,379 in view of Clausen (*Structure and Stability of Nitrated Alumina-Supported Mo Catalysts*) and Wu et al., U.S. Patent No. 6,162,352, and whether claims 9-17 are unpatentable over Wu et al., U.S. Patent No. 6,162,352 in view of Clausen (*Structure and Stability of Nitrated Alumina-Supported Me Catalysts*).

Grouping of the Claims

Each of the claims under appeal are separately patentable; therefore, each of the individual claims should be considered individually for the assignment of error. The claims hereunder do not stand or fall together.

Argument

The § 103 Rejection of claims 1-8

Drake discloses a hydrodesulfurization catalyst. This catalyst comprises alumina and a metal selected from the group consisting of molybdenum and tungsten. The catalyst can also contain an additional metal, selected from the group consisting of iron, cobalt, and nickel. Preferably, the catalyst is presulfided (see Drake, col. 5, lines 13-25).

Clausen discloses alumina supported, unpromoted molybdenum catalysts that are nitrified and sulfided. *See* Clausen, second paragraph.

Wu discloses a sulfided composition comprising, consisting of, or consisting essentially of, a zinc spinel, a zeolite, alumina, cobalt and molybdenum. *See* Wu, column 1, lines 64-67. Wu discloses an elemental molybdenum weight percent in the range of from about 1 weight percent to about 50 weight percent based on the total weight of the catalyst composition. *See* Wu, column 4, lines 18-23.

Applicants argue that Drake, Clausen, and Wu do not disclose the instant invention, either alone or in combination. The Clausen reference is not properly combinable with the Drake reference. Clausen notes “little is known about the transformation of the nitride structures and the structure and morphology of the resulting sulfide structures” (*see* Clausen, first paragraph). Therefore, it would not

have even been obvious for Drake to nitride the HDS catalyst, along with the pre-sulfiding. There is no need for pre-nitriding even suggested in the Drake reference. Applicants assert that one of ordinary skill in the art would not find motivation in Drake to seek out the nitriding of Clausen. In addition, there is no suggestion in Drake to seek out the weight percents of Wu.

The Examiner states “the applicant, however, fails to also point out that in the fourth paragraph of the Clausen reference a catalyst that is both pre-nitrified and pre-sulfided shows an increase in absorbed species as compared to a similar catalyst that has been sulfided in the standard manner. Also, it is important to note that both pre-sulfiding and pre-nitriding are very well known in the art for various hydrotreating catalysts.” *See* Final Office Action, page 7, lines 4-8.

The Clausen reference pertains to unpromoted catalysts (*see* Clausen, second paragraph). The instant application and the Drake reference both apply to promoted catalysts. The Clausen reference does state “little is known about the transformation of the nitride structures and the structure and morphology of the resulting sulfide structures.” *See* Clausen, first paragraph. Therefore, it would not be obvious the pre-nitriding as well as pre-sulfiding would work for promoted catalysts.

The Examiner further states that “both the catalysts of Drake and Clausen are effective hydrotreatment catalysts and therefore it would be appropriate to combine the references to include the pre-sulfiding and pre-nitriding of Clausen” (*see* Final Office Action, page 7, lines 9-11). Applicants maintain that what works for one hydrotreating catalyst does not automatically work for another. Since little is known about the nitride structure transformation and the resulting sulfide structure

morphology according to Clausen, it is not obvious that both pre-nitriding and pre-sulfiding would work for different hydrotreating catalysts.

Federal Circuit Court Decisions, such as *Uniroyal vs. Rudkin-Wiley*, 837 F2d 1044, 5 USPQ 2d 1434 (1988) citing *Interconnect Planning v. Fiel*, 774 F2d 1132, 227 USPQ 543 state that there must be some reason for combination, other than hindsight, gleaned from the invention itself. Applicant respectfully suggests that, apart from impermissible hindsight, there is no motivation to combine the Drake and Clausen references.

The § 103 Rejection of Claims 9-17

Wu discloses preparing a catalyst composition by mixing a zeolite, zinc spinel, and alumina together to form a mixture. The mixture is then shaped, preferably into extrudates. The mixture is thereafter calcined, and then it is incorporated with cobalt and molybdenum, and then it is calcined again. Then, the catalyst is sulfided (See Wu, col. 2, line 52 – col. 3, line 45). Clausen discloses nitriding, and then sulfiding alumina-supported unpromoted molybdenum catalysts (See Clausen, 2nd paragraph).

The Examiner states “It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the process of Wu to utilize the ammonia based nitriding of Clausen because both the Clausen and Wu references utilize catalysts that are effective for the purpose of hydrotreating and removing impurities. It would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize a process wherein nitriding is accomplished at least in part by contacting the cobalt/molybdenum modified catalyst

with a decomposable nitrogen-containing compound at a temperature of from 650°C to 800°C because nitriding is disclosed by the Clausen reference and it would be appropriate to utilize any temperature needed for accomplishment of nitriding so that an effective catalyst composition is formed. It would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize a process wherein nitriding is performed prior to contacting the cobalt/molybdenum catalyst with a sulfur-containing hydrocarbon stream under hydrodesulfurization conditions because Wu discloses a process whereby sulfiding is performed prior to contacting the catalyst with a sulfur-containing hydrocarbon stream under hydrodesulfurization conditions and the Clausen reference discloses nitriding prior to sulfiding.” (See Office Action, page 7, paragraph 3, to page 8, paragraph 1). Applicants respectfully disagree.

Applicants submit that neither Wu nor Clausen; either alone or in combination, disclose the claimed invention. Clausen discloses nitriding an alumina-supported, unpromoted molybdenum catalyst. The Wu compound has a zeolite, a zinc spinel, and cobalt in addition to alumina and molybdenum. This is clearly a different composition. It is not obvious that nitriding would also be effective for a different catalyst just because that different catalyst can also be used for hydrotreating and removing impurities. If two catalysts are used for the same purpose, but are in fact different compositions, then it is not obvious that the same pretreatment would be effective on both catalysts. Applicants respectfully submit that claim 9 of the instant application distinguishes over Wu by including the additional limitation of nitriding a cobalt/molybdenum alumina catalyst prior to sulfiding. The Clausen reference does

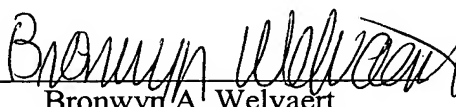
not supply the nitriding limit because it is not properly combinable with Wu. There is no motivation to combine Clausen with Wu, apart from improper hindsight.

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Based on the foregoing remarks, it is respectfully suggested that claims 1- 17 are patentable over the prior art. Reversal of the final rejection of claims 1- 17 is respectfully requested.

Respectfully submitted,

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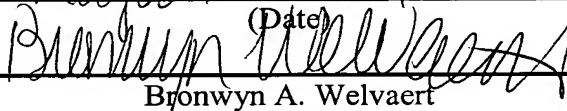
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CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, Alexandria, VA 22313-1450, on

12 August 2001

(Date)


Bronwyn A. Welvaert

APPENDIX I

Claims on Appeal

THAT WHICH IS CLAIMED IS:

1. (Previously Amended) A nitrided and sulfided catalyst composition comprising a cobalt compound, a molybdenum compound, and an inorganic oxide compound.
2. (Original) A catalyst composition according to claim 1 wherein the weight of the cobalt component of said cobalt compound as a percentage of the total weight of said catalyst composition is from about 0.1% to about 30%.
3. (Original) A catalyst composition according to claim 2 wherein the weight of the molybdenum component of said molybdenum compound as a percentage of the total weight of said catalyst composition is from about 1% to about 50%.
4. (Original) A catalyst composition according to claim 3 wherein the weight of the inorganic oxide compound as a percentage of the total weight of said catalyst composition is from about 10% to about 95%.
5. (Original) A catalyst composition according to claim 4 wherein said inorganic oxide compound is selected from the group consisting of silica, alumina, silica-alumina, magnesia, titania, zirconia, and mixtures of two or more thereof.
6. (Original) A catalyst composition according to claim 5 wherein said inorganic oxide compound comprises γ -alumina.

7. (Original) A catalyst composition according to claim 1 wherein said composition is nitrified prior to being sulfided.

8. (Original) A catalyst composition according to claim 7 wherein said catalyst composition is pre-nitrified and pre-sulfided.

9. (Original) A process of making a catalyst composition, said process comprises the steps of:

(a) contacting a cobalt compound and a molybdenum compound with an inorganic oxide compound to provide a cobalt/molybdenum-modified catalyst;

(b) nitrifying said cobalt/molybdenum-modified catalyst to provide a nitrified cobalt/molybdenum-modified catalyst; and

(c) sulfiding said nitrified cobalt/molybdenum-modified catalyst to provide a nitrified and sulfided cobalt/molybdenum catalyst.

10. (Previously Amended) A process according to claim 9 wherein step (a) is accomplished in part by impregnating said inorganic oxide compound with an aqueous solution containing said cobalt compound and said molybdenum compound.

11. (Original) A process according to claim 10 wherein step (a) is sufficient to incorporate said cobalt compound and said molybdenum compound into said inorganic oxide compound in an amount such that the weight of the cobalt component of said cobalt compound as a percentage of the total weight of said nitrified and sulfided cobalt/molybdenum catalyst is from about 0.1% to about 30% and the weight of the molybdenum component of said molybdenum compound as a

percentage of the total weight of said nitrided and sulfided cobalt/molybdenum catalyst is from about 1% to about 50%.

12. (Previously Amended) A process according to claim 11 wherein step (a) is accomplished in part by impregnating said inorganic oxide compound using an aqueous solution containing ammonium heptamolybdate and cobalt nitrate.

13. (Previously Amended) A process according to claim 11 wherein step (b) is accomplished in part by contacting said cobalt/molybdenum-modified catalyst with a decomposable nitrogen-containing compound at a temperature of from 650°C to 800°C.

14. (Original) A process according to claim 13 wherein said decomposable nitrogen-containing compound comprises ammonia.

15. (Previously Amended) A process according to claim 11 wherein step (c) is accomplished in part by contacting said nitrided cobalt/molybdenum-modified catalyst with a decomposable sulfur compound at a temperature of from 350° C to 450° C.

16. (Original) A process according to claim 15 wherein said decomposable sulfur compound comprises carbon disulfide.

17. (Original) A process according to claim 9 wherein steps (b) and (c) are performed prior to contacting said cobalt/molybdenum-modified catalyst with a sulfur-containing hydrocarbon stream under hydrodesulfurization conditions.

18. (Withdrawn) A hydrodesulfurization process comprising contacting a hydrocarbon feed containing a concentration of organic sulfur

compounds and a concentration of aromatic compounds with a catalyst composition comprising a nitrated and sulfided composition comprising a cobalt compound, a molybdenum compound, and an inorganic oxide compound under conditions sufficient to convert at least a portion of said concentration of organic sulfur compounds to inorganic sulfur compounds, thereby providing a hydrosulfurized hydrocarbon product.

19. (Withdrawn) A process according to claim 18 wherein the weight of the cobalt component of said cobalt compound as a percentage of the total weight of said catalyst composition is from about 0.1% to about 30%.

20. (Withdrawn) A process according to claim 19 wherein the weight of the molybdenum component of said molybdenum compound as a percentage of the total weight of said catalyst composition is from about 1% to about 50%.

21. (Withdrawn) A process according to claim 20 wherein said hydrocarbon feed is a heavy hydrocarbon fraction which boils in the range of from about 200° F to about 500° F.

22. (Withdrawn) A process according to claim 21 wherein said concentration of organic sulfur compounds in said hydrocarbon feed is from about 10 ppmw to about 10,000 ppmw.

23. (Withdrawn) A process according to claim 22 wherein said concentration of aromatic compounds in said hydrocarbon feed is such that the weight of aromatic compounds as a percentage of the total weight of said hydrocarbon feed is greater than about 10%.

24. (Withdrawn) A process according to claim 23 wherein said hydrocarbon feed contains a concentration of olefinic compounds such that the weight of olefinic compounds as a percentage of the total weight of said hydrocarbon feed is less than about 20%.

25. (Withdrawn) A process according to claim 22 wherein said concentration of aromatic compounds in said hydrocarbon feed is such that the weight of aromatic compounds as a percentage of the total weight of said hydrocarbon feed is greater than 50%.

26. (Withdrawn) A process according to claim 25 wherein said hydrocarbon feed contains a concentration of olefinic compounds such that the weight of olefinic compounds as a percentage of the total weight of said hydrocarbon feed is less than about 2%.

27. (Withdrawn) A hydrodesulfurization process comprising the steps of:

(a) separating a full range hydrocarbon feed containing a first concentration of organic sulfur compounds and a first concentration of aromatic compounds into a heavy hydrocarbon fraction and a light hydrocarbon fraction, wherein said heavy hydrocarbon fraction boils at a temperature above a cut-point temperature, wherein said light hydrocarbon fraction boils at a temperature below said cut-point temperature, and wherein said heavy hydrocarbon fraction contains a second concentration of organic sulfur compounds and a second concentration of aromatic compounds;

(b) contacting said heavy hydrocarbon fraction with a catalyst composition comprising a nitrated and sulfide composition comprising a cobalt compound, a molybdenum compound, and an inorganic oxide compound under conditions sufficient to convert at least a portion of said second concentration of organic sulfur compounds to inorganic sulfur compounds, thereby providing a hydrodesulfurized heavy hydrocarbon product; and

(c) combining said hydrodesulfurized heavy hydrocarbon product and said light hydrocarbon fraction to produce a hydrodesulfurized full range hydrocarbon product.

28. (Withdrawn) A process according to claim 27 wherein said first concentration of aromatic compounds is less than said second concentration of aromatic compounds and said first concentration of organic sulfur compounds is less than said second concentration of organic sulfur compounds.

29. (Withdrawn) A process according to claim 28 wherein said cut-point temperature is from about 150° F to about 350° F.

30. (Withdrawn) A process according to claim 29 wherein said first concentration of organic sulfur compounds is from about 5 ppmw to about 5000 ppmw, and wherein said first concentration of aromatic compounds is such that the weight of aromatic compounds as a percentage of the total weight of said full range hydrocarbon fraction is from about 10% to about 50%.

31. (Withdrawn) A process according to claim 30 wherein said second concentration of organic sulfur compounds is from about 10 ppmw to about 10,000 ppmw, and wherein said second concentration of aromatic compounds is such

that the weight of aromatic compounds as a percentage of the total weight of said heavy hydrocarbon fraction is greater than about 10%.

32. (Withdrawn) A process according to claim 31 wherein said heavy hydrocarbon fraction contains a concentration of olefinic compounds such that the weight of olefinic compounds as a percentage of the total weight of said heavy hydrocarbon fraction is less than about 20%.

33. (Withdrawn) A process according to claim 32 wherein said catalyst composition is the catalyst composition of claim 1.

34. (Withdrawn) A process according to claim 32 wherein said catalyst composition is the catalyst composition of claim 8.

35. (Withdrawn) A process according to claim 32 wherein said catalyst composition is the catalyst composition made by the process of claim 9.